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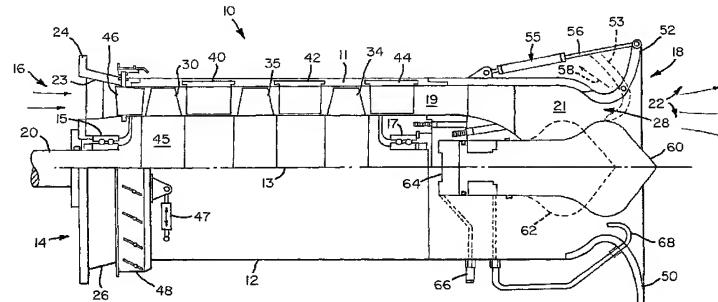
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(54) Title: AXIAL FLOW PUMP AND MARINE PROPULSION DEVICE



(57) Abstract: A mechanically reconfigurable marine propulsion device that adapts to engine torque and/or vessel speed thereby providing improved propulsive efficiency and performance. The axial flow propulsion device has two or more stages each having an impeller section and a stator section. Stator vanes and/or the pumping chamber provide a flow diffusion that generates increased hydrostatic pressure from ram pressure recovered from high velocity working fluid which, due to reduced fluid velocity and increased hydrostatic pressure, lowers cavitation events and frictional losses within the propulsion device. Optionally, variable-pitch vanes in the stator section control the amount of ram pressure imparted to the working fluid. Also optionally, variable-pitch inlet guide vanes control the whirl angle and/or mass flow rate of incoming fluid independently of rotor or vessel speed. A set of fixed or variable exit guide vanes aft of the pumping chamber provides flow straightening and pressure maintenance at a discharge nozzle. Other options include a dual flow concentric pumping arrangement that improves performance at low to moderate vessel speeds, an inlet diffuser that recovers ram pressure within an intake duct, and/or a variable area throat in the discharge nozzle that controls the water jet exit velocity according to vessel speed in order to maintain propulsive efficiency. Advantageously, the variable geometry propulsion device enables a shipmaster to achieve improved performance and fuel efficiency over a wide range of vessel speed, vessel loading, sea state conditions, power settings, and/or engine set points in order to achieve higher vessel speeds (e.g., 10 to 30kts) and/or greater range (e.g., 25-40%) over conventional marine pump jets (i.e., centrifugal or mixed-flow water jets), which is particularly useful for vessels utilizing 10 to 100 megawatt power plants.

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